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Abstract

The Karlsruhe Fast Breeder Project *

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The basic approach of a fast breeder reactor design of the second generation using non metallic fuel elements is outlined. The lower density and the trend to lower Pu contents result in lower power densities. This influences the choice of a proper coolant. The use of non metallic fuel elements brings an emphasis of the lower tail of the neutron spectrum. Most of the power coefficients, in particular the Doppler coefficient, is strongly influenced by that fact and this means that the basic problem of dynamic stability must be considered. The high burn-ups required for the second generation of fast breeder reactors are the basic problem for a proper fuel element design.

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* The Karlsruhe Fast Breeder Project is a common enterprise as an association of Gesellschaft für Kernforschung, Karlsruhe, and Euratom.

** The first part of the references is considered to be an integral part of this presentation. Members of the Karlsruhe team with more specific and published contributions are mentioned there. Apart from that all members of the Karlsruhe team are contributing heavily.

The desired closed fuel cycle brings the attention to the step of reprocessing and refabricating.

In the light of this reasoning the Karlsruhe Fast Breeder Project is explained. There are three main areas of activities:

a) Physics and Safety

Extended theoretical work is going on since the very beginning. The calculation of the Doppler coefficient and other power coefficients is one of the most important tasks. Apart from that a set of integral reactor experiments is prepared

SNEAK (Pu fueled fast critical facility)
STARK (coupled thermal fast reactor)
SUAK (fast pulsed subcritical assembly)
SEFOR (fast reactor for excursion tests)

b) Fuel Element Development

A fuel element for very high burn-up is being developed. The fuel itself and the cladding impose serious problems. Large-scale irradiation tests are prepared. In the same context the adjusted type of reprocessing and refabricating is considered and developed.

c) Choice of a proper coolant and the development of key hardware components

Besides Na, also He and dry steam are considered to be possible coolants. Conceptual design studies and the development of key components, like for example blowers, are carried out.

The more explicitly defined Fast Reactor Programme, to whom Euratom is associated, is complemented by some large-scale effort of the German industry. This complementary effort is shortly described.